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Comparison of Quality Engineering Practices in Malaysian and Indonesian Automotive Related Companies

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Abstract. The main motivating factor driving this research is to find differences between the automotive related companies in Malaysia and Indonesia with regard to quality engineering (QE) implementation. A comparative study between Malaysia and Indonesia provides the opportunity to gain perspective and thorough understanding of the similarities and differences on the critical factors for successful QE practices in the context of both these countries. Face to face interviews are used to compare the QE practices in two automotive companies in Malaysia and Indonesia, respectively. The findings of study showed that both countries have clear quality objectives to achieving zero defects in processes and products and total customer satisfaction. Top and middle management in both countries were found to be directly involved in quality improvement on the shop floor to provide On-The-Job training and actively encourage team members to perform quality problem solving through the formation of quality control circles (QCC) particularly in Indonesia automotive industry. In Malaysia automotive industry, the implementation was not fully effective, but they have started to cultivate those values in the daily execution. Based on the case study results and analysis, the researcher has provided suggestions for both countries as an improvement plan for successful QE implementation. These recommendations will allow management to implement appropriate strategies for better QE implementation which hopefully can improve company's performance and ultimately the making the automotive industry in both countries to reach world class quality. It is strongly believed that the findings of this study can help Malaysia and Indonesia automotive industries in their efforts to become more effective and competitive. **Keywords**: Quality engineering, Critical factors, automotive industry, Malaysia, Indonesia

1. Introduction

Quality engineering (QE) has been used in quality literature to denote many things. [1] believes that QE is the series of operational, managerial and technical process used by an organization to ensure that the quality of a goods and services produced are at the supposed or required levels. QE concentrates not only on the hard aspects of TQM but also the specialized technical factors of quality

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management. Krishnamoorthi [2], on the other hand, defines QE as the field that comprises technical methods, management and financing approaches, tools and techniques for problem solving, training and motivation methods, and computer-based information system and other fields required for planning, producing, and distributing goods and services to meet the consumer needs.

QE is focused on product/process design and production for meeting customer requirements, one can also define QE as the approach which consists of operational, managerial and engineering activities that a company uses for quality control (QC), quality improvement (QI) and quality assurance (QA) to achieve successful implementation of TQM [3]. This study is an attempt to provide insights into how the implementation of these quality management concepts focused on critical success factors (CSFs) for QE implementation in the automotive industry.

This paper provides an explanation and analysis of results of case studies conducted in two Indonesia automotive industries and two Malaysia automotive companies. The case studies were carried out during the period starting from January 2010 until June 2010. The purpose of the case study was to evaluate the existing QE implementation in terms of CSFs amongst automotive industries in Malaysia and Indonesia. It begins with a description of the methodology employed in eliciting relevant information concerning the case studied companies from the case study protocol. A summary of the current QE practices in both countries in terms of CSFs are presented. The paper culminates with a proposed suggestion, conclusions and some future research directions.

2. Methodology

2.1Introduction

Case study research is one of the techniques that are frequently used in collecting data, building theories, or validating theories. The main benefits of case study methodology are its ability to deal with contextual conditions and reality of many social phenomena and allow the researcher to start an investigation without knowing precisely the case boundaries [4]. In addition, case studies have the likelihood to be valid and consistent with empirical observation, which closely mirror reality [5].

Various issues concerning quality management have been carried out by previous researchers using a case study approach. Through the case study approach, various theories have been proposed, tested, and explained. The number of cases in the case study research varied from two to ten cases. Some previous researches using case study approach in quality management conducted by previous researchers (see for example, Galperin and Lituchy [6], Ritchie and Dale [7], Yusof and Aspinwall [8], Vouzas [9], Benavent *et al*. [10], Irianto [11], and Qui and Tannock [12]). Case study approach is used in this research to evaluate and to obtain in-depth analysis associated with the actual implementation of QE among automotive industries in Malaysia and Indonesia in term of critical factors.

2.2Case Study Methodology

In collecting empirical information and data for this study, the authors consulted the relevant experts in the field of quality engineering implementation and automotive industry. In the experts consultant step, the Delphi method used to obtain the experts judgments in terms of CSFs model for QE implementation. The results from Delphi method relating to CSFs for successful QE implementation has been described in an earlier publication by Putri and Yusof [13] as shown in Table 1. The CSFs for successful QE practices consist of nine factors and thirty-one sub factors.

Table 1. The CSFs for successful QE implementation based on result from Delphi method [13]

Major factors (criteria)	Sub-factors (sub-criteria)
Management responsibility	Strategic quality planning/quality policy; the role of divisional top management; top management commitment/support; internal stakeholders' involvement.
Resource management	Technology-and production related resources; financial-related resources; information and communication-related resources
People management	Employee involvement; education and training; teamwork and cooperation; work environment culture
Quality in design and process	Process management/operating procedures; role of quality department; product design; process analysis and improvement; applied quality tools and techniques
Measurement, analysis and feedback	Quality measurement, feedback and benchmarking; continuous improvement; performance measurement: external and internal; quality data and reporting; communication to improve quality; recognition and rewards; quality systems
Supplier management	Supplier quality management; contact with supplier and professional associates
Customer focus	Customer involvement; customer driven processes
Quality technical material	Standardization quality standard; quality control (QC) technical management
Quality jiritsuka/independent	Develop QC management; Independence without support from mother company

In this research, the data collection has combined several methods. They are face to face interviews, direct observation, organization documents, and feedback from experts in case study company. Face to face interviews were conducted with the person responsible for quality initiatives implementation as well as with the general manager taking approximately one and a half hours each time, and continuing for a few days after that because they had other activities they need to attend to. Therefore, the interview has to continue the following day or other days depending on the appointment set by the researcher and the person in the case company. Telephone calls were made to arrange the date for next visit for interview followed up by e-mail. The interview protocol was sent to the expert before face to face interview. Development of case study protocol is essential in order to facilitate data collection. In this study interview protocol was developed in the form of semi-structured interviews. The interview protocol comprises all the questions in terms of critical factors and their sub factors for successful QE implementation. It is a major tool for increasing the reliability and validity of case study research. The semi-structured interview was developed based on literature review of CSFs in QE. The main questions asked are "how" and "why" a particular approach or practice was adopted. Some of the questions are based on informal conversation with top management and/or quality engineering/quality assurance managers from selected companies. Apart from the face to face interview, relevant documents were also referred to for clarification purposes and when possible copies provided by the case companies. Certain issues were obtained through observation by the researcher.

The interview is centred on questions about CSF for QE implementation. Only those questions relevant to the implementation of QE in the case companies were further investigated. In addition, clarification was sought, if necessary, through telephone calls, e-mail, or follow up visits to related companies. The purpose was to clarify the answers given by the expert in related companies so that it is consistent with the intended question. In Indonesia, interviews were conducted in Indonesian language. As for Malaysia, it was conducted in English and Malay, which means that the interview protocol uses two languages, that is, English and Indonesian.

The first section in the semi-structured interview provides the explanation on the objective and the scope of research, general information about the company, such as statement of vision and mission;

number of employees; type of product made; and other relevant information. The next section in the semi-structured interview contains questions relating to how the existing implementation of the critical factors to achieve successful implementation of the QE which includes nine criteria and 31 sub criteria in the case study companies.

2.3Overview of the Companies Studied

According to Malaysian Industrial Development Authority (MIDA), there are four automobile manufacturers, nine assemblers, three composite body sports car makers, 23 franchise holders which have the rights to assemble various makes and models of passenger and commercial vehicles, nine motor cycles manufacturers or assemblers, and 350 component manufacturers in the country [14]. In Indonesia, according to data from the Association of Indonesia Automotive Industries or known as Gaikindo, until 2006, there are 16 assemblers, 21 sales agents, 7 parts manufacturer, and 4 major components companies. Perusahaan Otomobil Nasional Sendirian Berhad (PONSB), which manufactures the Proton brand, is one of the largest car manufacturers in Malaysia. Similarly, Toyota Motor Manufacturing Indonesia (TMMIN) and Astra Daihatsu Motor (ADM) are the two largest car assembling companies in Indonesia that produces Toyota and Daihatsu brand respectively. Meanwhile, automotive industry Sendirian Berhad (AISB) is one of the largest original equipment manufacturer (OEM) in Malaysia which produces exhaust systems for national and non-national car companies. These four companies were selected as the case study companies to observe on the implementation of QE relating to the critical success factors. Case study was conducted in four companies, where PONSB and AISB represent Malaysia automotive industry and TMMIN and ADM representing Indonesia automotive industry. The selection of four cases indicates that this study meets the guidelines given by Eisenhardt [5] who indicated that a single investigator will have difficulty if handling more than four cases. In addition, time and resources constraints are also important consideration. Table 2 shows a summary of all case study companies which consist of three car manufacturers and one original equipment manufacturer (OEM).

Table 2. The overview of the studied companies

Characteristics	AISB	PONSB	TMMIN	ADM
Ownership	Malaysian	Malaysian	Indonesian and Japanese	Indonesian and Japanese
Product	Exhaust system	Passenger car	Passenger car	Passenger car (5/7 seats MPV and SUV)
Main production facility	Computerized manufacturing facility (dual torch autoweld machine; CNC pipe bending machine; noise test; etc)	Integrated manufacturing facility	Integrated manufacturing facility	Flexible assembly line (semi-automotic and partially robotic)
Type of foreign cooperation (main country)	Original equipment material (OEM) manufacturer (Malaysia)	Product (automobile) manufacturer, Malaysia	Product co-manufacturer (Japan)	Product co-manufacturer (Japan)
Major market	Local and Foreign	Local and Foreign (ASEAN, China, Indian subcontinent, Middle East-North Africa, UK/Western Europe, Australia and South Africa)	Local and Foreign (Asia Pacific, East Timor, Venezuela, Brazil, Pakistan, South Africa, Argentina)	Local and Foreign (South East Asia, Japan, Middle East, General Africa, South Africa, Mexico and Venezuela)
Yearly production		200,000 units (Shah Alam) and 150,000 units (Tanjung Malim)	100,000 units	270,000 units
Number of employees	488	11,500	5,271	7,000

3. QE Implementation at Selected Companies: Case Study Results

This section describes the QE practices at case study companies based on the interview and direct observation of the researcher. The results are used to evaluate the current implementation of QE in Malaysia and Indonesia automotive industries and to determine the uniqueness amongst the case study companies.

The findings show that top and middle management in all four companies have a high level of commitment to quality improvement efforts in their respective companies. All of them have a clear vision and mission in achieving customer satisfaction and they always put customer satisfaction both internal and external customers in every process and adopted the Toyota way principles in improving quality and productivity. Some initiatives implemented include just in time, building in quality, and every day Kaizen. They believed that the Toyota way philosophies are relevant to their businesses and when practiced can improve the effectiveness of their QE implementation.

However, it was observed that those companies with shares dominated by the Japanese such as TMMIN and ADM, applied Toyota Way culture more when compared to the other two case study companies. Both companies believe that the right process will produce the right result. Everyone in the company continues to identify the root causes and prevent similar problems do not occur. This is the focus of continuous learning system at both companies. The evidence is there are many QCC in companies that actively conduct continuous improvement (every day Kaizen) in the company and participated in various competitions held within the company itself and held in the Astra group.
In AISB, as the largest OEM in Malaysia believe that by adopting the Toyota Way culture at the company targets can be achieved. While PONSB formerly worked with Mitsubishi, Japan, adopted the principles taught by MMC. PONSB is attempting to develop their production system called Proton production system by adopting the Toyota production system (TPS). However, there is not much effort yet in PONSB to fully adopt Toyota way philosophies in a formal manner throughout the organizations.

With the implementation of every day Kaizen, all the companies are trying to become learning organizations. Top and middle management always encourages low level management (team member) to solve problems related to Quality (Q), Cost (C), Delivery (D), Safety (S), and Morale (M). In addition, with the QCC, all companies encourage their employees to solve the problems in their workplace by team work approach. All the companies are also continuously teaching employees on how to work together as a team to achieve company's quality goals.

In problem solving associated with QCDSM, the companies are implementing systematic approach known as PDCA cycle and feedback system. All companies also apply genchi genbutsu i.e. solve the problem by looking directly what is actually happening in the workplace (shop floor). For TMMIN and ADM, genchi genbutsu is routinely performed by top management; even the vice president participates in giving OTJ training to team members. Top management at TMMIN and ADM do not believe in only looking at the report on shop floor problems given by subordinates, but they directly observe the problems and together seek the root causes. In PONSB, genchi genbutsu activities are less routinely performed by top management. Genchi genbutsu are more often performed by middle management who then report to top management about problems that occur on the shop floor associated with QCDSM.

In TMMIN and ADM, product planning and design stages are the responsibility of TMC and DMC, Japan, respectively as the mother companies. Sometimes product engineers from TMMIN and ADM are also included in new product development process. In PONSB, new product development process conducted by the directorate of product planning and development. In AISB as an OEM manufacturer

receive technical drawing of product from car manufacturer such as PONSB, Toyota and Perodua. At times, AISB are also asked to propose its own design with the help of technical assistance from outside parties designated by the car manufacturer.

In the product design and planning stages, Malaysia automotive industries have applied more tools and techniques compared to Indonesia automotive industries. As for the tools and techniques used in process design stage, both Malaysia and Indonesia automotive industries are implementing similar tools and techniques. However, Indonesia automotive industries implement many tools and techniques in production quality control including 7 basic tools; 7 new tools, process capability studies, and Just in time.

The manufacturing processes are well documented in the form of standard operating procedure (SOP) in all companies and are periodically reviewed. Changes on the process are made based on the result of process evaluation and their employees are actively involved in process change implementation. All companies used the concept of defects investigation. TPM is implemented for production maintenance and all the companies have a quality department that continues to monitor quality performance. This department has autonomy regarding quality in all companies.

For introducing and using the tools and techniques, training is provided starting from top management right down to the lower management in all the companies studied, through OTJ training, knowledge of the tools and techniques are transferred to their subordinates. However for fundamental skills, training is provided directly to the team members in all companies, especially training about tools and techniques used for quality problem solving. TMMIN, ADM, and PONSB are certified ISO 9001 companies, whereas AISB is certified by ISO/TS 16949. All companies conduct quality measurement, supplier quality level monitoring, and benchmarking with other company. TMMIN, ADM, and PONSB also work in partnership and long term relationships with their suppliers to develop supplier capabilities. The three companies provide assistance to improve the quality and responsiveness of suppliers including advice; dispatched engineers to suppliers; financial assistance; etc. Cross case comparisons among the four companies are shown in Table 3.

4. Discussions

According to the case study results, both Indonesia and Malaysia automotive industries use TPS. The culture adopted from the mother company has a direct influence on the culture of the Indonesia automotive industry in such as way that middle and top managers are ready and willing to launch a cultural shift. This culture continues to support the success of sustainable quality improvement. As for the Malaysian automotive industries, they are local companies and have also adopted the Toyota Way culture but its implementation has not been that effective.

In achieving successful implementation of QE the automotive industry must take into consideration two important factors. They are management responsibility and people management. Indonesia automotive industry is highly influenced by Japanese culture showed that the top and middle managers in both studied companies in Indonesia encourage teams to conduct Kaizen in the workplace. QCC is also actively promoted for continuous quality improvement. It can be seen that the Indonesia automotive industries have a clear direction in their philosophy and production system i.e. Toyota way philosophy and TPS.

However, due to strong influence from the mother company, the case companies in Indonesia have no full authority in relation to their production systems such as in the case of new product development process. They only participate in a minor portion or perhaps to a less significant number of components in a unit of the car. Since the Indonesia automotive industries are less involved in the product design stage, it resulted in a lack of understanding and implementation of employee-related

tools and techniques used in this phase. In the case of process design and planning, they are given full authority by the mother company, although under supervision and assistance from the mother company.

In relation to individual creativity and innovation, team members in Indonesia automotive industries have high creativity and innovation through QCC. Team members are given full authority to stop line production if they find any quality problems and then work as a team in solving quality problem. Communication to improve quality also exists between top and middle managers and team members. Even the Vice president also participates and performs gemba Kaizen and provides OTJ training.

In the case of Malaysia, the findings indicate that both the companies have also adopted the philosophy of the Toyota Way and TPS. However, the Kaizen initiative has not been effectively implemented in both companies. This is evident from the lack of active role of the QCC in continuous quality improvement. Team members are not encouraged to solve problems in teamwork approach. The lack of number in QCC resulted in lower individual creativity and innovation in both companies. In addition, top management is not encouraging individual development in relation to continuous quality improvement. At the same time, top management does not give full authority to team in making decisions relating to quality related problems. Team members must first report to middle management if they find problems, then middle management report to top management. Top management is less active in conducting direct observations in shop floor and provides OTJ training. Direct observation activities are only done by middle management. Top management is only waiting for a report from middle management.

Table 3. Cross case comparison of QE practices

Evidence	TMMIN	ADM	AISB	PONSB
1. Management responsibility				
Strategic quality planning (SQP) communicated throughout the company	Yes	Yes	Yes	Yes
SQP always evaluated regularly by leaders	Yes	Yes	Yes	Yes
Company has vision and mission related to quality improvement	Yes	Yes	Yes	Yes
Company implements Toyota way principles and adopt TPS	Yes	Yes	Yes	Yes
Support the belief "built in quality"	Yes	Yes	Yes	Yes
Apply quality gate to support "built in quality" belief	Yes	Yes	Yes	Yes
Each division has clear and measurable KPI	Yes	Yes	Yes	Yes
Develop PDCA cycle and feedback system	Yes	Yes	Yes	Yes
Leaders conduct direct observation to shop floor and actively involve in problem solving	Yes	Yes	Yes	Sometimes
Leaders committed to continuous quality improvement as ultimate goal	Yes	Yes	Yes	Yes
Leaders support long term quality improvement process	Yes	Yes	Yes	Yes
Leaders always communicate and dialogue with team members	Yes	Yes	Yes	Sometimes
Leaders committed in providing resources and guidance as well as improving working conditions	Yes	Yes	Yes	Yes
Leaders always encourage individual development and continuous improvement through involvement	Yes	Yes	Yes	Sometimes
Leaders take responsibility for quality performance by giving guideline through OTJ training	Yes	Yes	Yes	Sometimes
2. Resource management				
Technology development support by leaders	Yes	Yes	Yes	Yes
The current technology meet customer demand	Yes	Yes	Yes	Yes
Funding was allocated for quality improvement efforts	Yes	Yes	Yes	Yes
Financial performance was evaluated periodically	Yes	Yes	Yes	Yes
Availability of information and communication for company system improvement	Yes	Yes	Yes	Yes
The current information system can supply the needs of both internal and external company	Yes	Yes	Yes	Yes
3. People management				
Foster a culture that enhances continuous improvement (Kaizen) through individual creativity and team work	Yes	Yes	Yes	Not effective
Implement QCC program	Yes	Yes	Yes	Not effective

Encourage team member to make decisions relating to their work for quality improvement through QCC	Yes	Yes	Yes	Sometimes
Implement suggestion and feedback systems	Yes	Yes	Yes	Not effective
Implement learning by doing fashion (OTJ development)	Yes	Yes	Yes	Yes
Company provides resources for employees' training	Yes	Yes	Yes	Yes
Company provides employee with training and education to increase their capabilities and skill	Yes	Yes	Yes	Yes
Team members have the authority to take direct action or to stop line production if they find any problem	Yes	Yes	Yes	Sometimes
No differences in "status" between leaders and team members	Yes	Yes	Yes	Slight difference
Company has management training system	Yes	Yes	Yes	Yes
Problem solving approach applied to solve quality problems	Yes	Yes	Yes	Yes
Every job is structured to support the work team approach through standardized work	Yes	Yes	Yes	Yes
Team members involve in the formulation of policy and company strategy	No	No	Yes	No
4. Quality in design and process				
Company used the concept of finding the defects	Yes	Yes	Yes	Yes
Company systematically manage its processes	Yes	Yes	Yes	Yes
Company implements total productive maintenance	Yes	Yes	Yes	Yes
Company conducts product design	Sometimes	Sometimes	Sometimes	Yes
Coordination among affected department in the product development process	Yes	Yes	Yes	Yes
Company implements process change	Yes	Yes	Yes	Yes
Team members are actively involved in process change implementation	Yes	Yes	Yes	Yes
Results from process evaluation are used to make changes about the process	Yes	Yes	Yes	Yes
Company has well documented SOP for the entire process	Yes	Yes	Yes	Yes
Quality department has an autonomy regarding quality in company	Yes	Yes	Yes	Yes
Quality department served as the coordinator and representative of leaders in running the rule of quality	Yes	Yes	Yes	Yes
Use quality tools and techniques to improve quality	Yes	Yes	Yes	Yes
5. **Measurement, analysis, and feedback**				
Company conducts quality measurement, supplier quality level monitoring, and benchmarking	Yes	Yes	Yes	Yes
Company assesses internal and external quality issues	Yes	Yes	Yes	Yes
Quality data is available for team members and leaders	Yes	Yes	Yes	Yes

Quality data is used to manage quality and to evaluate supervisor and managerial performance	Yes	Yes	Yes	Yes
Top-down and bottom-up communication is conducted between management and team member in improving quality	Yes	Yes	Yes	Yes
Company provides the reward to ideas and suggestions for quality improvement	Yes	Yes	Yes	Yes
Company certified ISO 9001 quality management system and/or ISO/TS 16949	Yes	Yes	Yes	Yes
6. Supplier management				
Company has built up strong and close relationships with supplier	Yes	Yes	Yes	Yes
Company works in partnership with suppliers	Yes	Yes	Yes	Yes
Company provides technical assistance to improve the quality and responsiveness of suppliers	Yes	Yes	Sometimes	Yes
Supplier involves in the design process and in the product development process	Sometimes	Sometimes	No	Sometimes
Company provides clarity of specifications to suppliers	Yes	Yes	Yes	Yes
Supplier receives assistance in terms of financial assistance	Yes	Yes	Not available	Yes
7. Customer focus				
Customer involvement is helpful in the product design	Yes	Yes	Yes	Yes
Company conducts analysis and review of customer information	Yes	Yes	Yes	Yes
Customer works as “partner” throughout the new product development process	Yes	Yes	Yes	Yes
Need to get final design approval from the customer	Sometimes	Sometimes	Yes	Sometimes
Use JD Power Initial Quality Study to collect customer information	Yes	Yes	NA	Yes
Quality of technical material and Quality Jiritsuka/independent				
Company conducts standardization of quality standards and develops QC management	Yes	Yes	NA	Yes

Case study results indicate that the study is in line with research conducted by Fauzi *et al*. [15]. They conducted a comparative study to investigate the application of quality between Japanese and non-Japanese electronic and electrical companies. The results show that the QCC is more widely adopted in Japanese firms compared to non-Japanese companies. QCC is used at every level of an organization that involves people. QCC is an effective activity to improve quality. Fauzi *et al*., (2007) also proves that the QCC is one of the activities undertaken by Japanese firms compared to non-Japanese companies.

The results of this research also reinforce the study by Ebrahimpour and Withers [16]. They also conducted a comparative study between Japanese and non-Japanese companies. The results showed that employees at Japanese companies have work participation and high responsibility towards the quality compared to non-Japanese companies. They also stated that the involvement of production employees of non-Japanese companies in quality control efforts is very low compared with Japanese companies. Every employee in Japanese companies do their own maintenance on their equipment on a daily basis, while non-Japanese companies do not perform their own maintenance on their equipment in which maintenance activities are only submitted to the maintenance department.

Therefore, both the companies studied in Malaysia are largest local OEM and largest local car manufacturer in Malaysia, so it is profitable for them to have full authority in all stages of their production systems. Use of tools and techniques in every stage of QE at Malaysia automotive industry is also more diverse than the Indonesia automotive industry. Malaysia automotive industries have conducted their own new product development process. It can be concluded that the Malaysia automotive industry is more independent than Indonesia automotive industry. Malaysia automotive industry is not a shadow of the mother company as in the case of Indonesia automotive industry.

Top management in Indonesia automotive companies always encourage their employees to participate in the QCC and provide financial and non-financial rewards to employees. While top management in Malaysia automotive industries provide less encouragement to their employees to participate in QCC. They do provide financial reward to its employees for suggestions proposed by the employee. There is a more active contribution from team members on the activities and conventions between the QCC in Indonesia than the companies studied in Malaysia. Results from case studies also indicate that Indonesian companies are better on several critical factors such as the support and commitment from top management, a high response from employees and behaviours of team members in continuous improvement. Therefore it can be said that the QCC provides a positive impact on increasing employee involvement in continuous quality improvement.

5. Conclusions and Further Research Directions

This paper has described and discussed the QE practices in two automotive industries in Malaysia and Indonesia in relation to the nine factors for successful implementation of QE. An overview of the case companies is first described followed by further descriptions of individual companies. QE practices in each case companies were then explained followed by cross case analysis through comparison of current practice in each company. Cross case comparisons include nine critical factors for successful of QE implementation i.e. management responsibility; resource management; people management; quality in design and process; measurement, analysis, and feedback; supplier management; customer focus; quality of technical material; and quality jiritsuka/independent. Finally, the overview of QE practices from both countries are discussed and presented.

Based on case studies, recommendations were made on both countries as an improvement plan to achieve a successful application of QE. They include 1) Employee involvement in QCC must continue to be built and applied. Top management should always encourage employees to engage in quality improvement activities, such as QCC and direct observation at the source of the problem. At the end, it

will head towards a sustainable quality improvement; 2) Top and middle management actively build a culture of continuous quality improvement by gradually changing the behaviour of employees to constantly alert the quality of processes and products; 3) Both countries always conduct a survey of customer and employee satisfactions to obtain feedback from customers and employees; 4) Both countries should continuously develop strong relationships and partnerships with suppliers and provide assistance for improving suppliers' quality and embed continuous quality improvement culture to suppliers.

Finally, the sample used in this study only represents the automotive industry in Malaysia and Indonesia. One way to strengthen this research is to repeat the same methodology in other countries in the ASEAN region such as Thailand, Philippines, or even other countries in the world. Thus, it is expected to obtain new insights about the critical factors for achieving success in the automotive industry QE. Future research should replicate the study using the instrument that was developed and possibly look into conducting a longitudinal study. However, it is hoped that this work has contributed to the comparative analysis of quality implementation between countries and will have useful application in the near future.

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Comparison of Quality Engineering Practices in Malaysian and Indonesian Automotive Related Companies

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Abstract

The main motivating factor driving this research is to find differences between the automotive related companies in Malaysia and Indonesia with regard to quality engineering (QE) implementation. A comparative study between Malaysia and Indonesia provides the opportunity to gain perspective and thorough understanding of the similarities and differences on the critical factors for successful QE practices in the context of both these countries. Face to face interviews are used to compare the QE practices in two automotive companies in

Malaysia and Indonesia, respectively. The findings of study showed that both countries have clear quality objectives to achieving zero defects in processes and products and total customer satisfaction. Top and middle management in both countries were found to be directly involved in quality improvement on the shop floor to provide On-The-Job training and actively encourage team members to perform quality problem solving through the formation of quality control circles (QCC) particularly in Indonesia automotive industry. In Malaysia automotive industry, the implementation was not fully effective, but they have started to cultivate those values in the daily execution. Based on the case study results and analysis, the researcher has provided suggestions for both countries as an improvement plan for successful QE implementation. These recommendations will allow management to implement appropriate strategies for better QE implementation which hopefully can improve company's performance and ultimately the making the automotive industry in both countries to reach world class quality. It is strongly believed that the findings of this study can help Malaysia and Indonesia automotive industries in their efforts to become more effective and competitive.

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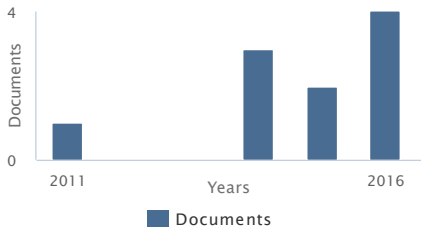

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